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Zhang, Yanfei; Yue, Yuanzheng

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Two distinct structural domains for sub- T_g relaxation in glass fibers

Yanfei Zhang^{1,2} and Yuanzheng Yue^{1,2}

¹*Section of Chemistry, Aalborg University, Aalborg DK-9000, Denmark*

²*Key Laboratory of Processing and Testing Technology of Glass & Functional Ceramics of Shandong Province, Shandong Polytechnic University, Jinan 250353, China*

Structural heterogeneity and its impact on structural relaxation during sub- T_g annealing provide a key to better understand the dynamic slowing down near the glass transition temperature (T_g). In this work we present our findings about sub- T_g relaxation of the hyperquenched glass fibers with the composition of 20CaO-22MgO-58SiO₂. This composition is highly unstable, since crystallization occurs slightly above T_g . The calorimetric curves show two separated relaxation peaks below T_g , and this implies that two distinct structural domains which are arrested in the supercooled liquid during hyperquenching. The first relaxation peak is much smaller than the second one. With increasing the annealing degree, the first one is vertically diminishing, while the second one shifts from lower to high temperature and is becoming smaller. This indicates that the two structural domains are correlated with each other. We also provide some insights into the relation between structural relaxation and nucleation.